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To: PEP-II Operations

From: John D. Fox

Subject: Longitudinal Feedback Amplifiers, turning OFF via EPICS, effect of SCP reset

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This last week we had a situation where we were getting reflected power trips out of the LER amplifier #1, and over the holiday week-end we decided that we should shut off the RF amplifiers in amps 1 and 4 (which drive kicker #2). This is done via the EPICS LFB panels. However, it became apparent afterwards that we kept running over the week-end with the amplifiers ON. I think the confusion rests with the interaction of the amplifier reset button on the SCP, which resets FAULTED amplifiers. This note is my attempt to explain how to turn OFF amplifiers via EPICS.

Background:

The LER and HER longitudinal feedback systems each have tunnel high-power loads, tunnel beam-line kicker structures, and a set of high-power amplifiers in building 641 (IR-4). All of these components can be damaged by beam-induced signals or applied amplifier power. There are three types of fault monitoring implemented in each system:

Flow Switches - each kicker and set of tunnel high-power loads are water cooled, and flow switches indicate the presence of adequate flow. If a flow switch trips OFF, a beam abort is issued for that ring. A load without cooling will be damaged by very modest beam currents and any applied amplifier power. The damaged load then causes all power to be reflected into the amplifier. The state of the flowswitches is shown in the BATS PR04 panel, under “Long FBKick Flowsw”

Thermocouples - there are sets of thermocouples monitoring load and kicker temperatures, and a software process checks for out-of-limit temperatures. If a temperature limit is exceeded, the monitor software issues a BEAM ABORT, and the associated amplifiers are FAULTED and taken off-line. The state of this software-sensed TC signal is shown on the Kicker Flowswitch panel under “LFBK Temp FAULT”.

Amplifier reflected power - each amplifier measures the reflected power, and if the amplifier safe power level is exceeded the amplifier FAULTS. This condition will FAULT all the associated amplifiers (taking a whole ring offline), and also issue a BEAM ABORT signal (the FDBK AMPLITUDE OVERLD beam abort).

The amplifiers measure forward and reflected power, even if the amplifier is turned “OFF” via EPICS. This reverse power protection is important for protecting the tunnel vacuum components and the amplifiers

IMPORTANT NOTE-

Because the amplifiers are air cooled by forced air, if there is beam-induced power applied to the amplifier, the amplifier MUST BE POWERED ON (must have the AC power on). If an amplifier circuit breaker is turned off, there is no cooling to the amplifier and it will be damaged by beam induced power.

To TURN OFF an AMPLIFIER via EPICS

If it is decided to turn off an amplifier, or set of amplifiers, go to the LFB top level panel, and click on the high level VXI crate. In that panel there are four amplifier symbols. Each of the am-

plifiers has an individual panel, showing the amplifier status, forward and reverse power, etc. On this panel is an ON/OFF toggle which can turn off the RF amplifier, but does not shut off the instrumentation, the fault logic, or the amplifier cooling. If the plan is to shut off amplifiers #1 and #4 you must go to both the amplifier #1 and amplifier #4 panels and flip the toggle to off. You can then see that the forward power will go to zero.

INTERACTION with the FAULT RESET button on the SCP.

If an amplifier is faulted (from reverse power or from the thermocouple or flow switch trips) there is a button on the SCP which clears the faults. This involves shutting off the AC power to all the amplifiers in the ring, resetting the fAULT module and logic, and then turning the amplifiers ON. ALL of the amplifiers get turned on by this procedure - even if one or more were previously OFF via EPICS control. Cycling the AC power loses the information in the amplifier regarding the software state. As such, if you ever send the fault reset from the SCP, but want some amplifiers to be OFF, you must turn them OFF manually from the EPICS panels after they have reset and the AC power has been cycled back on. Because the EPICS system has no knowledge that the SCP has cleared the OFf command, it is possible for the EPICS panel to show the toggles OFF, even though the amplifier is clearly running and putting out power. In such a case, toggling the amp ON, then OFF, will set the amplifier OFF and the displays will be consistent.

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